UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/530,795	11/07/2005	John Charles Sinclair	3642.1001-000	9371

21005 7590 03/31/2008

HAMILTON, BROOK, SMITH & REYNOLDS, P.C.
530 VIRGINIA ROAD
P.O. BOX 9133
CONCORD, MA 01742-9133

EXAMINER	
LEE, JAE W	

ART UNIT	PAPER NUMBER
1656	

MAIL DATE	DELIVERY MODE
03/31/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/530,795	SINCLAIR ET AL.	
	Examiner	Art Unit	
	JAE W. LEE, PhD	1656	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 December 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-33* is/are pending in the application.

4a) Of the above claim(s) *26-33* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-25* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *08 April 2005* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *11/07/2005*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Application status

The previous amendment to claims, filed on 04/08/2005, is acknowledged, wherein Applicants have amended claims 4-6, 9, 16, 22, 24-26, 29-31 and 33 and canceled claim 34.

Claims 1-33 are pending in this application.

Priority

The instant application is the 371 national stage entry of PCT/GB03/04306, filed on 10/08/2003, which claims benefit of UNITED KINGDOM 0223323.7, filed on 10/08/2002, as requested in the declaration. The Examiner notes that the requirements of national stage entry of the instant application had been completed (note assigned U.S. filing date) within 30 months of the earliest claimed priority date; the related international application includes both a search report and a preliminary examination report.

Election

Applicant's election with traverse of Group I, Claims 1-25 in the response filed on 12/17/2007, is acknowledged.

Applicants argue that Narayana et al. do not teach all of the limitations of Claim 1 because Claim 1 requires a repeating unit "comprising at least a first monomer which is

a monomer of a first oligomer assembly which is symmetrical in three dimensions." Applicants also argue that Narayana et al. do not teach all of the limitations of either Claim 26, because Claim 26 does not describe merely performing x-ray crystallography on the protein lattice - rather it describes the "use of the protein lattice as a support in x-ray crystallography."

Applicants' arguments have been fully considered but are not deemed persuasive for the following reasons. Claim 1 recites "which is symmetrical in three dimensions" and not *three dimensional symmetry*. As such, "2-fold symmetry" taught by Narayana et al. anticipates claim 1 because it is *symmetrical in three dimensions*. There is nothing in claim 1 that requires "a first oligomer assembly" to have a *three dimensional symmetry* (italicized for added emphasis). For the reasons provided herein, the shared technical feature of the groups is not a special technical feature and unity of invention between the groups does not exist.

Claims 26-33 are withdrawn from further consideration by the Examiner, 37 CFR 1.142(b) as being drawn to a non-elected invention.

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Drawings

New corrected drawing in compliance with 37 CFR 1.121(d) is required in this application because Figure 2 is missing. However, the specification on pg. 4, lines 3-5, describes the content of Fig. 2. Applicant is advised to employ the services of a competent patent draftsperson outside the Office, as the U.S. Patent and Trademark Office no longer prepares new drawings. The corrected drawings are required in reply to the Office action to avoid abandonment of the application. The requirement for corrected drawings will not be held in abeyance.

Objections to the Specification

The specification is objected to for inappropriate notation of an Internet address. On page 4 line 19, Internet address is cited in an unacceptable form. See M.P.E.P. 707.05(e) for the acceptable notation of an Internet address. The examiner suggests the replacement of Internet citations with appropriate references because Internet pages are subjected to frequent changes and deletions and could be different when the public accesses the Internet page to view the exactly same information.

The disclosure is objected to because it contains an embedded hyperlink and/or other form of browser-executable code. Applicant is required to delete the embedded hyperlink and/or other form of browser-executable code. See MPEP § 608.01.

The abstract of the disclosure is objected to because it contains a sentence that goes on for 266 words, which exceeds the limitation (150 words) as set forth in MPEP

§ 608.01(b). The abstract also contains legal phraseologies, such as "means" and "said," which should be avoided.

Applicants are reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

This application contains sequence disclosures that are encompassed by the definitions for nucleotide and/or amino acid sequences set forth in 37 CFR 1.821(a)(1) and (a)(2). However, this application fails to comply with the requirements of 37 CFR 1.821 through 1.825; Applicants' attention is directed to the final rulemaking notice published at 55 FR 18230 (May 1, 1990), and 1114 OG 29 (May 15, 1990). To be in compliance, Applicants should identify nucleotide sequences of at least 10 nucleotides

and amino acid sequences of at least 4 amino acids in the specification by a proper sequence identifier, i.e., "SEQ ID NO:" (see MPEP 2422.01). If these sequences have not been listed in the computer readable form and paper copy of the sequence listing, applicant must provide an initial computer readable form (CRF) copy of the "Sequence Listing", an initial paper copy of the "Sequence Listing", as well as an amendment directing its entry into the specification, and a statement that the content of the paper and CRF copies are the same and, where applicable, include no new matter as required by 37 C.F.R. 1.821(e) or 1.821(f) or 1.821(g) or 1.821(b) or 1.825(d). See particularly pg. 21, last paragraph of the specification containing nucleic acid sequences, and therefore, those sequences should be represented by proper sequence identifier numbers.

Appropriate correction is required.

Claim Objections

Claims 5, 6 and 13 are objected to because of the following informalities:

Claims 5, 6 and 13 are objected to because the recitation of "[[...]]" is not compliant with the rules as set forth in 37 CFR § 1.121 (c) (2). The changes in any amended claim must be shown by underlining (for added matter) or strikethrough (for deleted matter). For deletions of five characters or fewer, double brackets may be used. For strikethrough that cannot be easily perceived, double brackets must be used. As an alternative to using double brackets, extra portions of text may be included before

and after text being deleted, all in strikethrough, followed by including and underlining the extra text with the desired change.

Appropriate correction is required.

Claim Rejections - 35 U.S.C. § 112

The following is a quotation of the second paragraph of 35 U.S.C. § 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-25 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1-25 are unclear and confusing in the recitation of the word "respective" in many different phrases:

Claim 1: "respective oligomer assembly;"

Claim 2: "in respect of respective ones of said rotational symmetry axes," "respective first monomers," and "said respective one of said set of rotational axes;"

Claim 3: "the respective one of said set of rotational symmetry axes," "respective further oligomer assemblies," and "respective further oligomer assembly being aligned with said respective one;"

Claim 4: "respective one of said set of rotational symmetry axes," "in respect of respective ones of said set of rotational symmetry axes," "respective first monomers," "respective further oligomer assemblies," and "respective rotational symmetry axis;"

Claim 6: "respective oligomer assembly;"

Claim 8: "respective one of said set of rotational symmetry axes," and "respective further oligomer assembly;"

Claim 11: "respective one of said set of rotational symmetry axes;" and

Claim 18: "respective first monomers."

It is acknowledged by the Examiner that there is much complexity with regard to the claim language and the way it describes the claimed protein lattice. Unfortunately, it is also apparent that the use of the word "respective" in multiple, different phrases in the claims as shown above only adds to the confusion in discerning what the protein lattice is composed of. For instance, the phrase, "the monomers each being monomers of a respective oligomer assembly" in claim 1, is unclear and confusing because it can be interpreted as describing that the monomers belongs to a separate oligomer assembly, or alternatively as describing that the monomers belong to a single oligomer assembly which is different with respect to other oligomer assemblies that might be present therein. Similar problems exist in the phrases as shown above, and it is not clear what Applicants' intent is with regard to the multiple uses of "respective" and how it relates "oligomer assembly," "rotational symmetry axes" and "first monomers" to other such

entities in the protein lattice. It is suggested that applicants clarify the meaning of the noted phrases.

Claim 1-25 are unclear and confusing in the recitation of the word "first" in many different phrases:

Claims 1, 2, 4, 13 and 18: "first oligomer assembly," and "first monomers;"

Claims 3, 10, 11, 14 and 19: "first oligomer assembly;"

Claim 8: "first and further monomers," "first oligomer assembly," and "first monomers."

It is unclear because first is a relative term and also because there is no recitation of second or third, etc. Therefore, it is unclear and confusing as to how these "first oligomer assembly" and "first monomers" are related to any other oligomer assemblies and monomers that make them "first." It is suggested that applicants clarify the meaning of the noted phrase.

The following is a quotation of the first paragraph of 35 U.S.C. § 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1-25 are rejected under 35 U.S.C. § 112, first paragraph, written description, as failing to comply with the written description requirement. The claim(s)

contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

The instant claims are directed to a genus of protein lattices having a regular structure with any repeating unit repeating in three dimensions, the repeating unit comprising any protein protomers which each comprise at least two of any monomer fused together, the monomers each being monomers of a respective oligomer assembly into which the monomers are assembled for assembly of the protomers into the lattice, wherein the repeating unit comprises protomers comprising at least a first monomer which is a monomer of a first oligomer assembly which is symmetrical in three dimensions.

The Court of Appeals for the Federal Circuit has recently held that a "written description of an invention involving a chemical genus, like a description of a chemical species, 'requires a precise definition, such as be structure, formula [or] chemical name,' of the claimed subject matter sufficient to distinguish it from other materials." University of California v. Eli Lilly and Co., 1997 U.S. App. LEXIS 18221, at *23, quoting Fiers v. Revel, 25 USPQ2d 1601, 1606 (Fed. Cir. 1993) (bracketed material in original). To fully describe a genus of genetic material, which is a chemical compound, applicants must (1) fully describe at least one species of the claimed genus sufficient to represent said genus whereby a skilled artisan, in view of the prior art, could predict the structure of other species encompassed by the claimed genus and (2) identify the common characteristics of the claimed molecules, e.g., structure, physical and/or chemical

characteristics, functional characteristics when coupled with a known or disclosed correlation between function and structure, or a combination of these (paraphrased from Enzo Biochemical Inc. v. Gen-Probe Inc. (CAFC (2002) 63 USPQ2d 1609).

The specification discloses only a single representative species of a protein lattice comprising a fusion protein comprising the human ferritin heavy chain (HFH) and the E. coli PurE encoded by human HFH and E. coli PurE genes amplified by PCR from human cDNA and E. coli gDNA, respectively using primers 5'-CCT TAG TCG AAT TCA TGA CGA CCG CGT CCA CC-3' and 5'-GGG AAA TTA GCC CTC GAG TTA GCT TTC ATT ATC-3' for the ferritin gene, and primers 5'-GTT TTA AGA CCC ATG GCT TCC CGC AAT AAT CCG-3' and 5'-CGC AAA CCT GGA TCC TGC CGC ACC TCG CGG-3', for the PurE gene, as shown in Figure 1 (see also pg. 21, last paragraph). Although the specification discloses that HFH and PurE proteins have $P_4(O, 432)$ and D_4 point groups, respectively, it is noted by the Examiner that the specification is silent about what the three dimensional symmetry the fusion protein comprising HFH and PurE is.

However, this single disclosed species fails to provide adequate written description for a genus of protein lattices having a regular structure with any repeating unit repeating in three dimensions, the repeating unit comprising any protein protomers which each comprise at least two of any monomer fused together, the monomers each being monomers of a respective oligomer assembly into which the monomers are assembled for assembly of the protomers into the lattice, wherein the repeating unit comprises protomers comprising at least a first monomer which is a monomer of a first oligomer assembly which is symmetrical in three dimensions.

In this case, the specification fails to describe any identification of structural characteristics or properties of any protein lattice having any repeating unit repeating in three dimensions, the repeating unit comprising any protein protomers which each comprise at least two of any monomer fused together. Without adequate guidance with respect to the genus of protein lattices as claimed, one of skill in the art would not have recognized that the genus of protein lattices, encompassing widely variant species having essentially any structure, can be used in extremely diverse applications as listed in pg. 25, i.e., catalyzing biotransformations, data storage, display, charge separation, nanowire, motor, mould and X-ray crystallography. Please refer to the M.P.E.P. section 2163 [R-5] under II, A, 3, (a), (ii) for more details with respect to sufficient number of representative species that should be disclosed to describe a widely variant genus.

Given the lack of additional representative species of the genus of protein lattices having a regular structure with any repeating unit repeating in three dimensions, the repeating unit comprising any protein protomers which each comprise at least two of any monomer fused together, as encompassed by the claim, Applicants have failed to sufficiently describe the claimed invention, in such full, clear, concise, and exact terms that a skilled artisan would recognize Applicants were in possession of the claimed invention.

Applicant is referred to the revised guidelines concerning compliance with the written description requirement of U.S.C. 112, first paragraph, published in the Official Gazette and also available at www.uspto.gov.

Claims 1-25 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement, because the specification, while being enabling for a protein lattice comprising a fusion protein comprising the human ferritin heavy chain (HFH) and the E. coli PurE encoded by human HFH and E. coli PurE genes amplified by PCR from human cDNA and E. coli gDNA, respectively using primers 5'-CCT TAG TCG AAT TCA TGA CGA CCG CGT CCA CC-3' and 5'-GGG AAA TTA GCC CTC GAG TTA GCT TTC ATT ATC-3' for the ferritin gene, and primers 5'-GTT TTA AGA CCC ATG GCT TCC CGC AAT AAT CCG-3' and 5'-CGC AAA CCT GGA TCC TGC CGC ACC TCG CGG-3', for the PurE gene, as shown in Figure 1, does not reasonably provide enablement for any protein lattice having a regular structure with any repeating unit repeating in three dimensions, the repeating unit comprising any protein protomers which each comprise at least two of any monomer fused together, the monomers each being monomers of a respective oligomer assembly into which the monomers are assembled for assembly of the protomers into the lattice, wherein the repeating unit comprises protomers comprising at least a first monomer which is a monomer of a first oligomer assembly which is symmetrical in three dimensions as encompassed by the claims. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention commensurate in scope with these claims.

The factors to be considered in determining whether undue experimentation is required are summarized In re Wands 858 F.2d 731, 8 USPQ2nd 1400 (Fed. Cir, 1988). The Court in Wands states: "Enablement is not precluded by the necessity for some

experimentation such as routine screening. However, experimentation needed to practice the invention must not be undue experimentation. The key word is 'undue,' not 'experimentation.' " (Wands, 8 USPQ2d 1404). Clearly, enablement of a claimed invention cannot be predicated on the basis of quantity of experimentation required to make or use the invention. "Whether undue experimentation is needed is not a single, simple factual determination, but rather is a conclusion reached by weighing many factual considerations." (Wands, 8 USPQ2d 1404). The factors to be considered in determining whether undue experimentation is required include: (1) the quantity of experimentation necessary, (2) the amount or direction or guidance presented, (3) the presence or absence of working examples, (4) the nature of the invention, (5) the state of the prior art, (6) the relative skill of those in the art, (7) the predictability or unpredictability of the art, and (8) the breadth of the claims. While all of these factors are considered, a sufficient amount for a prima facie case is discussed below.

Claims 1-25 are so broad as to encompass any protein lattice having a regular structure with any repeating unit repeating in three dimensions, the repeating unit comprising any protein protomers which each comprise at least two of any monomer fused together, the monomers each being monomers of a respective oligomer assembly into which the monomers are assembled for assembly of the protomers into the lattice, wherein the repeating unit comprises protomers comprising at least a first monomer which is a monomer of a first oligomer assembly which is symmetrical in three dimensions.

The specification discloses a protein lattice comprising a fusion protein encoded by human ferritin heavy chain (HFH) and the E. coli PurE genes amplified by PCR from human cDNA and E. coli gDNA, respectively using primers 5'-CCT TAG TCG AAT TCA TGA CGA CCG CGT CCA CC-3' and 5'-GGG AAA TTA GCC CTC GAG TTA GCT TTC ATT ATC-3' for the ferritin gene, and primers 5'-GTT TTA AGA CCC ATG GCT TCC CGC AAT AAT CCG-3' and 5'-CGC AAA CCT GGA TCC TGC CGC ACC TCG CGG-3', for the PurE gene. Although the specification discloses that each of the HFH and PurE proteins has $P_4(O, 432)$ and D_4 point group, respectively, it is noted by the Examiner that the specification is silent about what the three dimensional symmetry of the fusion protein comprising HFH and PurE is. The specification is also silent about how the aforementioned protein lattice comprising HFH and PurE can be used in any of the applications listed on pg. 25, i.e., catalyzing biotransformations, data storage, display, charge separation, nanowire, motor, mould and X-ray crystallography.

With regard to the use of all possible "proteins lattices," it is noted by the Examiner that not all structurally different protein lattices having a regular structure with any repeating unit repeating in three dimensions, the repeating unit comprising any protein protomers which each comprise at least two of any monomer fused together would be able to form a structure that has the three dimensional symmetry. Such protein lattices would not enable one of skill in the art to use the claimed invention in extremely diverse applications such as catalyzing biotransformations, data storage, display, charge separation, nanowire, motor, mould and X-ray crystallography. Therefore, the limited disclosure of the specification as described above is not

commensurate with the breadth of claimed products encompassing the use of all possible "protein lattices."

The claims rejected under this section of U.S.C. 112, first paragraph, do not place any structural limits on the "protein lattices," "protomers," and "monomers." Since the amino acid sequence of a protein determines its structural and functional properties, predictability of which proteins can be used while obtaining the desired function requires a knowledge of and guidance with regard to which amino acids in the polypeptide's sequence, if any, are conserved (i.e. expectedly intolerant to modification), and detailed knowledge of the ways in which the polypeptide's structure relates to its desired function. In addition, the scope of the claims is not commensurate with the enablement provided by the disclosure with regard to the extremely large number of different peptides/proteins.

Particularly with respect to Claim 6 which recites the phrase, "with peptide elements being absent from, substituted in, or added to...," despite the fact that recombinant and mutagenesis techniques were known, it is not routine in the art to screen for multiple substitutions or multiple modifications, as encompassed by the instant claims, and the positions within a protein's sequence where amino acid modifications can be made with a reasonable expectation of success in obtaining the desired activity/utility are limited in any protein and the result of such modifications is unpredictable. In addition, one skilled in the art would expect any tolerance to modification for a given protein to diminish with each further and additional modification, e.g. multiple substitutions.

The specification does not support the broad scope of the claims which encompass any protein lattice comprising all modifications and fragments of any monomers and any protomers because the specification does not establish: (A) regions of any monomer and protomer which may be modified without affecting the desired functions of said monomers and protomer, i.e., the ability to fuse or non-covalently interact together to form a protein lattice while having a three-dimensional symmetry; (B) the general tolerance of any monomer and protomer to modification and extent of such tolerance without affecting the aforementioned desired functions; (C) a rational and predictable scheme for modifying any monomer and protomer of any protein lattice with an expectation of obtaining the desired activity/utility; (D) how such protein lattices having any structure can be used in extremely diverse applications listed on pg. 25, i.e., catalyzing biotransformations, data storage, display, charge separation, nanowire, motor, mould and X-ray crystallography; and (E) the specification provides insufficient guidance as to which of the essentially infinite possible choices is likely to be successful.

Because of this lack of guidance, and the fact that the relationship between the polypeptide sequence of a protein and its activity/function is not well understood and unpredictable (e.g., see Ngo et al. in The Protein Folding Problem and Tertiary Structure Prediction, 1994, Merz et al. (ed.), Birkhauser, Boston, MA, pp. 433 and 492-495, Ref: U, Form-892), it would require undue experimentation for one skilled in the art to make and use the claimed products.

The scope of the claims must bear a reasonable correlation with the scope of enablement (In re Fisher, 166 USPQ 19 24 (CCPA 1970)). Without sufficient guidance, determination of any protein lattice having the desired biological characteristics is unpredictable and the experimentation left to those skilled in the art is unnecessarily, and improperly, extensive and undue. See In re Wands 858 F.2d 731, 8 USPQ2nd 1400 (Fed. Cir, 1988).

Claim Rejections - 35 U.S.C. § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. § 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-25 are rejected under 35 U.S.C. § 102(b) as being anticipated by Padilla et al. (Nanohedra: Using symmetry to design self assembling protein cages, layers, crystals, and filaments, PNAS, 2001, Vol. 98, No. 5, pg. 2217–2221, see IDS), in view of the evidentiary reference Hestenes (Retrieved from the Internet at <http://modelingnts.la.asu.edu/pdf/crystalsymmetry.pdf>, [Retrieved on 3/18/08]).

The instant claims are drawn to a protein lattice having a regular structure with a repeating unit repeating in three dimensions, the repeating unit comprising protein protomers which each comprise at least two monomers fused together, the monomers

each being monomers of a respective oligomer assembly into which the monomers are assembled for assembly of the protomers into the lattice, wherein the repeating unit comprises protomers comprising at least a first monomer which is a monomer of a first oligomer assembly which is symmetrical in three dimensions.

It is noted by the Examiner that the term, "monomer," is not defined in the specification. Although page 8, lines 9-30 describes what *may be* considered as a monomer, i.e., "The monomers *may be* naturally occurring proteins, or *may be* modified by peptide elements being *absent from, substituted in, or added* to a naturally occurring protein…," there is nothing in the specification that excludes other smaller molecules from being encompassed by the term (italicized for added emphasis). As such, the term, "monomer(s)," will be interpreted according to the Merriam-Webster dictionary as "a chemical compound that can undergo polymerization" (see attached).

The reference of Padilla et al. teaches a protein lattice comprising a tetrahedral protein cage with a repeating unit in three-dimension as shown in Figure 2 a-c on pg. 2219, wherein said repeating unit comprises the 49-kDa fusion protein made up of 2 different monomers, i.e., bromoperoxidase and M1 matrix protein of influenza virus connected by a nine-residue helical linker (see under "A Designed Cage" on pg. 2217), are fused together (as shown in Figure 1 b), which assembles into an assembly of 12 fusion proteins or assembly (see the paragraph under "Designed Cage" on pg. 2219) as shown in Figure 1 e, which forms a tetrahedral protein cage. It is noted by the Examiner that the protein cage taught by Padilla et al. is "symmetrical in three dimensions" because Applicants states that such symmetry includes a tetrahedral symmetry (see pg.

2 of Applicant Argument, filed on 02/28/2008). Therefore, the aforementioned protein lattice anticipates Claim 1. Claims 2-4 are anticipated because there are rotational symmetry axes extending from the protein cage (see Figure 1 e) whereby said monomers are arranged symmetrically around or aligned with respect to said rotational symmetry axes. It is noted by the Examiner that there are 12 different rotational symmetry axes in the tetrahedral symmetry. Claim 5 is anticipated because there are at least 3 orders of rotational symmetry in the tetrahedral symmetry. Claim 6 is anticipated because said monomers are based on a naturally occurring protein, i.e., M1 matrix protein of influenza virus, with peptide elements substituted in or added, i.e., a nine-residue helical linker, to the naturally occurring protein without affecting assembly of said monomers into oligomer assembly. Claim 7 is anticipated because said monomers or protomers are fused via linking group, i.e., bromoperoxidase which forms trimers, and M1 matrix protein of influenza virus which forms dimers. Claim 8 is anticipated because the linking groups, i.e., bromoperoxidase and M1 matrix protein of influenza virus, are in their normal forms prior to assembly to reduce any difference in the position of (a) the termini of said monomers in their arrangement in said assembly in its natural form symmetrically around the set of rotational symmetry axes, and (b) the termini of said further monomers form symmetrically around said rotational symmetry axis of further oligomer assembly. Claim 9 is anticipated because the protomers that assemble into the protein cage are made up of homologous monomers, if one interprets a "monomer" to be said fusion protein taught by Padilla et al. Claims 10 and 12 are anticipated because said assembly has the tetrahedral point group as mentioned above. Claims 16

and 17 are anticipated because protomers that assemble into the protein cage are made up of heterologous monomers, if one interprets a "monomer" to be an amino acid residue. Claims 11, 13-15 and 20 are anticipated because the structure taught by Padilla et al having a tetrahedral point group also belongs to a genus of dihedral point groups. Claims 18, 19 and 21 are anticipated because a tetrahedral point groups belong to a genus of cyclic point groups according to the evidentiary reference of Hestenes (see pg. 7, bottom paragraph and Table 3 on pg. 8, Retrieved from the Internet at <http://modelingnts.la.asu.edu/pdf/crystalsymmetry.pdf>, [Retrieved on 3/18/08]). Claims 22, 23 and 24 are anticipated because the protein lattice taught by Padilla et al. has an array of macromolecular entities, i.e., said fusion proteins, attached thereto, and also because such fusion proteins harbor an affinity tag, N-terminal histidine tag, for the ease of purification via the use of nickel chelating columns (see pg. 2219, right column, lines 1-3). Claim 25 is anticipated because Claim 25 is drawn to the use of protein lattice of claim 1, which is given a limited patentable weight because a recitation of the intended use of the claimed invention, which does not result in a structural difference between the claimed invention and the protein lattice taught by said reference in order to patentably distinguish the claimed invention from the prior art. For the reasons described herein, the reference of Padilla et al. anticipates Applicants' claimed invention.

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the

unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 1-25 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-31 and 33 of copending Application No. 11/807922. Although the conflicting claims are not identical, they are not patentably distinct from each other because both sets of claims are drawn to a protein lattice or structure comprising repeating protomers comprising at least two monomers fused together, and further having rotational symmetry axis, thereby having overlapping scope of the claimed invention. Further more, claims are supported by almost identical specifications.

A timely filed terminal disclaimer in compliance with 37 C.F.R. § 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 C.F.R. § 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 C.F.R. § 3.73(b).

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Conclusion

Claims 1-25 are rejected for the reasons as stated above. Applicants must respond to the objections/rejections in this Office action to be fully responsive in prosecution.

The instant Office action is non-final.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jae W. Lee whose telephone number is 571-272-9949. The examiner can normally be reached on 8:00-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kathleen Kerr Bragdon can be reached on 571-272-0931. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only.

For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/JAE W LEE, PhD/
Examiner, Art Unit 1656

/Richard G Hutson, Ph.D./
Primary Examiner, Art Unit 1652